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ABSTRACT

The paper reports the final evaluation of a program for approximately 143 learning disabled (LD) students (grades 6-to-12) from six school districts. A number of test instruments were used to evaluate student progress during the program, including the Wide Range Achievement Test (WRAT), the Durrell Analysis of Reading Difficulty, and the Piers-Harris Self Concept Scale. Among findings were that five of the six classrooms tested showed significant improvement in all three achievement areas of the WRAT, with the gains being 1 1/2 times that expected from the previous learning history of the students. The Piers-Harris Self Concept Scale revealed that the program produced a reliable enhancement of self-concept of 6.19 percentile points. The Durrell Test confirmed the WRAT with overall gains of 35% over that expected. (Included are charts and diagrams, a report on "Validation of a Mnemonic Technique to Increase Vocabulary", and a list of 11 special accomplishments.) (PHR)

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PROGRAMS FOR CHILDREN WITH SPECIFIC LEARNING DISABILITIES

P.L. 91-230, Title VI-G

BEST COPY AVAILABLE

FORMAL FINAL EVALUATION

(Statistical Analysis of Data)

July 1, 1977, to June 30, 1978

PROJECT NAME: OKLAHOMA CHILD SERVICE DEMONSTRATION CENTER

PROJECT LOCATION: Route 3, Hillside School
Cushing, Oklahoma 74023

PROJECT EVALUATOR:

(Signature) Philip J. Murphy, Ph.D.

DATE OF REPORT SUBMISSION: July 31, 1978

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PROGRAM EVALUATION METHODS AND PROCEDURES

The Oklahoma Title VI-G Child Service Demonstration Center has undergone four previous annual evaluations during the funding period from 1973-1977. The present and fifth annual evaluation provides a continuing examination of this project's activities and their effects. Special features of this evaluation are: 1) The use of linear regression analysis to investigate the prediction of achievement test gains by affective domain measures, and 2) a study using an imagery mnemonic procedure to enhance vocabulary learning in this secondary learning disabled population.

SUBJECTS

Subjects involved in the program evaluation were students, from the sixth to the twelth grades, who had been assessed via a psychoeducational evaluation to be learning disabled. These students were then placed in the learning resource room in the six rural/semi-rural school districts of Cushing, Drumright, Perkins, Ripley, Stroud and Yale.

A total of 143 students were served directly by the program throughout the year, of which 107 were males and 36 were females, i.e. a 3 to 1 ratio.

In the analyses to follow, not all of the 143 students are included. Shrinkage in data was due to family moves, absenteeism and mainstreaming prior to data collection.

PROCEDURES:

1. The data analyses were based on pre and post testing at the beginning and end of the 1977-78 school year on all students with instruments listed in the next section.

2. Achievement change scores are presented not only in grade level increments but also in changes of percentage of actual gain over expected gain.

3. Random samples of students were given the Durrell Analysis of Reading Difficulty Test and the KeyMath Diagnostic Arithmetic Test to examine more closely the changes wrought by the program in learning processes.

4. Linear regression analyses were performed on several sets of data. Affective pre test scores were considered the independent variables or predictors and achievement test change scores were considered the dependent variables. The present evaluation initiated this form of analysis in order to discern the contributions that self-concept, study habits and study attitudes differentially make to achievement gains in Reading, Spelling and Arithmetic.

5. A separate study was performed to determine if the use of a imagery mnemonic procedure would enhance the learning ability in foreign language vocabulary for the project's students. The Key Word method was used as the experimental treatment and learning rate changes were the dependent variables in this study.

INSTRUMENTS AND MEASURES

Wide Range Achievement Test

The WRAT was administered to all the students in the program in a pre-post fashion in September and in May. This test yielded

three change scores in the Reading, Spelling and Arithmetic achievement areas.

These measures have been used in the four previous evaluations.

Durrell Analysis of Reading Difficulty

This test was administered in a pre-post (September-April) fashion to a random sample of students. This testing yielded 7 separate measures of reading grade level - Oral Reading, Silent Rate, Silent Comprehension, Word Recognition-Flash, Word Recognition-Analysis, Visual Memory and Phonetic Spelling. This test has been used in the four previous evaluations.

KeyMath Diagnostic Test

This test was administered in a pre-post (September-April) fashion to a random sample of students. This testing yielded 14 separate measures of math grade level. These fourteen separate measures are organized into three main sections of Content (numeration, fractions, geometry and symbols), Operations (addition, subtraction, multiplication, division, mental computations, numerical reasoning) and Applications (word problems, missing elements, money, measurement, time). This test has been reported in the last evaluation.

Survey of Study Habits and Attitudes (SSHA)

This standardized questionnaire was given in group administration to all students in the program in a pre-post fashion (within one month of program entry - April). It was included to obtain estimates of both behavioral and attitudinal factors that correlate well with academic achievement, but are not related to intelligence. All questions and the answer options were read to the students by the examiner. Seven

measures were derived from the SSHA: Percentile Scores on Work Methods, Delay Avoidance, Study Habits, Teacher Approval, Education Acceptance, Study Attitude and Study Orientation.

This test was used in the 1974-75, 1975-76 and 1976-77 evaluations.

Piers-Harris Self Concept Scale

This standardized questionnaire was given to all students in the program, via group administration, in a pre-post fashion. From this scale, the following measures were computed: Behavioral Self Esteem, Intellectual and School Status Self Esteem, Physical Appearance and Attributes Self Esteem, Freedom from Anxiety Self Esteem, Popularity Self Esteem, Happiness and Satisfaction Self Esteem and Total Self Esteem. This test was used in the 1976-77 evaluation.

Fundamental Interpersonal Relations Orientation - Behavior

The FIRO-B is a standardized questionnaire which was given to all students in the program in a pre-post manner.

This questionnaire measures the degree and kind of interpersonal stance of the examinee. It is purported to tap three basic dimensions of interpersonal relations - affection, control and inclusion. The FIRO-B generates six measures: expressed inclusion, expressed control, expressed affection, wanted inclusion, wanted control and wanted affection. The difference between the expressed and wanted dimensions is that expressed measures the interpersonal signals that one is sending and wanted measures the interpersonal behavior that one desires from others. All of these measures are confined to the behavioral domain. The test was used in the 1974-75, 1975-76 and 1976-77 evaluations.

Fundamental Interpersonal Relations Orientation - Feeling

The FIRO-F is a standardized questionnaire which was given to all students in the program in a pre-post manner.

This questionnaire is a replica of the FIRO-B in form and theory. The only difference is the content of the questions and the confinement of the FIRO-F to the affective domain of interpersonal feelings. This test was used in the 1974-75, 1975-76 and 1976-77 evaluations.

RESULTS

Academic Achievement

Wide Range Achievement Test

All students were given the WRAT at the start and the end of the school year. Table 1 shows the results for the three (3) subtests of the WRAT and a mean achievement score for the eight schools. The Table depicts the Pre, Post and Change Scores, the Actual Gain/Expected Gain Ratios, the t ratio and their associated probabilities. T tests for dependent samples were performed to evaluate the reliability of the change scores in each school, using one-tailed tests.

Only in one classroom, Perkins, was there no evidence of significant improvement. In five classrooms, Cushing High School, Cushing Middle School, Drumright, Stroud and Yale, all three achievement areas showed significant improvement. In Ripley, Reading and Arithmetic showed reliable improvements. In Central Vocational-Technical School, Spelling and Arithmetic showed significant gains. On mean achievement, the eight classrooms ranked from best to worst in the following manner: Drumright, Cushing High School,

TABLE 1

WRAT READING, SPELLING AND ARITHMETIC GRADE LEVEL PRE, POST AND CHANGE SCORES, ACTUAL GAIN/EXPECTED GAIN RATIOS FOR THE EIGHT SCHOOLS

SCHOOL	N	PRE	POST	CHANGE	ACTUAL/EXPECTED GAIN GAIN	t.	p.
			READING				
Cushing High School	14	4.61	5.59	.98	2.71	4.87	.001
Cushing Middle School	25	4.04	4.80	.76	1.53	5.72	.001
Drumright	17	5.11	6.52	1.41	2.65	6.05	.001
Perkins	11	5.2	5.67	.47	1.02	1.32	NS
Ripley	17	5.98	6.76	.78	1.18	1.77	.05
Stroud	20	5.03	5.76	.73	1.35	4.10	.001
Yale	20	4.46	4.74	.28	.64	1.87	.04
Central Vo-Tech	4	2.73	3.26	.53	3.69	1.89	NS
TOTAL	128	4.78	5.54	.76	1.62		
			SPELLING				
Cushing High School	14	3.09	3.65	.56	2.33	5.89	.001
Cushing Middle School	25	3.30	3.68	.38	.93	3.44	.005
Drumright	17	4.52	5.48	.96	2.03	4.89	.001
Perkins	11	4.30	4.22	-.08	-.21	-.34	NS
Ripley	19	4.81	5.51	.70	1.32	1.43	NS
Stroud	20	4.03	4.35	.32	.74	1.85	.05
Yale	20	3.44	4.03	.59	1.77	4.03	.001
Central Vo-Tech	4	2.88	3.58	.70	4.66	4.04	.025
TOTAL	130	3.86	4.38	.52	1.40		
			ARITHMETIC				
Cushing High School	14	4.84	5.43	.59	1.55	4.25	.001
Cushing Middle School	25	4.16	5.11	.95	1.85	6.58	.001
Drumright	17	4.27	5.36	1.09	2.45	8.56	.001
Perkins	11	4.73	4.85	.12	.28	.54	NS
Ripley	19	4.85	5.47	.62	1.16	4.79	.001
Stroud	20	4.62	5.19	.57	1.14	3.78	.005
Yale	20	4.53	5.21	.68	1.54	3.98	.001
Central Vo-Tech	4	4.85	5.10	.25	.99	2.89	.05
TOTAL	130	4.55	5.25	.70	1.48		
			MEAN ACHIEVEMENT				
Cushing High School	14	4.18	4.89	.71	2.20		
Cushing Middle School	25	3.83	4.53	.70	1.44		
Drumright	17	4.63	5.79	1.16	2.38		
Perkins	11	4.74	4.91	.17	.36		
Ripley	19	5.21	5.91	.70	1.22		
Stroud	20	4.56	5.10	.54	1.08		
Yale	20	4.14	4.66	.52	1.32		
Central Vo-Tech	4	3.49	3.98	.49	3.11		
TOTAL	130	4.40	5.06	.66	1.50		

Cushing Middle School, Ripley, Stroud, Yale, Central Vo-Tech and Perkins.

The actual gain/expected gain ratio showed that on the average the students achieved 162% of expected in Reading, 140% of expected gain in Spelling, 148% of expected gain in Arithmetic and 150% of expected gain over all three achievement areas. On the average program participation leads to 1½ times the gain expected from one's previous learning history.

Durrell Analysis of Reading Difficulty Test

This diagnostic reading test was given in a pre-post fashion to a random sample of 76 students in the program. Table 2 depicts the Pre, Post and Change Scores, and the Actual Gain/Expected Gain Ratio for the seven schools for the seven areas tapped by the Durrell.

The next Table shows the mean grade level change scores, the calculated t ratios for dependent samples with their associated probabilities and the actual gain/expected gain ratio for the seven areas averaged across the seven schools (Table 3). All seven areas of reading showed significant improvement. Visual memory showed the strongest improvement of the seven areas; this is important because of the need pointed out in previous evaluations for the project to devote more emphasis to this area. In the second and third evaluations, this area showed no improvement and it was questioned at that time whether this was a remediable process. It appears that more work devoted to building up that disability by the Child Service Demonstration Center staff has resulted in strong improvements in that area.

The 135% actual gain over expected gain on the Durrell is slightly lower than the 162% figure for the WRAT Reading.

TABLE 2

DURRELL ANALYSIS OF READING DIFFICULTY TEST GRADE LEVEL
PRE, POST AND CHANGE SCORES, ACTUAL GAIN/EXPECTED GAIN RATIO
FOR SEVEN SCHOOLS

SCHOOL	N	PRE-TEST	POST-TEST	CHANGE	ACTUAL/EXPECTED GAIN GAIN
		ORAL READING			
Cushing High School	2	2.25	2.88	.63	3.45
Cushing Middle School	22	3.46	4.06	.60	1.55
Drumright	2	4.0	5.38	1.38	3.20
Perkins	7	4.24	4.53	.29	.76
Ripley	15	4.45	4.92	.47	.94
Stroud	16	4.02	4.64	.62	1.32
Yale	12	2.77	3.48	.71	2.33
		SILENT RATE			
Cushing High School	2	2.00	2.75	.75	4.63
Cushing Middle School	22	3.32	3.61	.29	.78
Drumright	2	4.00	5.00	1.00	2.33
Perkins	7	3.81	4.29	.48	1.39
Ripley	15	3.85	4.54	.69	1.62
Stroud	16	3.59	4.24	.65	1.54
Yale	12	2.88	3.44	.56	1.79
		SILENT COMPREHENSION			
Cushing High School	2	3.88	4.76	.88	2.79
Cushing Middle School	22	4.05	5.05	1.00	2.21
Drumright	2	4.63	5.51	.88	1.77
Perkins	7	3.91	4.82	.91	2.56
Ripley	15	4.98	5.28	.30	.36
Stroud	16	5.02	5.10	.08	.13
Yale	12	4.06	4.69	.63	1.41
		WORD RECOGNITION			
Cushing High School	2	3.50	3.75	.25	.87
Cushing Middle School	15	4.65	4.95	.30	.58
Drumright	2	5.25	6.50	1.25	2.23
Perkins	6	4.83	5.70	.87	1.98
Ripley	14	5.26	5.67	.41	.71
Stroud	13	4.45	5.37	.92	1.77
Yale	10	3.44	3.87	.43	1.14

(continued)

TABLE 2 (continued)

DURRELL ANALYSIS OF READING DIFFICULTY TEST GRADE LEVEL
PRE, POST AND CHANGE SCORES, ACTUAL GAIN/EXPECTED GAIN RATIO
FOR SEVEN SCHOOLS

SCHOOL	N	PRE-TEST	POST-TEST	CHANGE	ACTUAL/EXPECTED GAIN
			WORD ANALYSIS		
Cushing High School	2	3.88	4.26	.38	1.19
Cushing Middle School	15	4.79	5.29	.50	.94
Drumright	2	5.88	6.56	.68	1.08
Perkins	6	4.78	5.43	.65	1.50
Ripley	14	5.49	5.57	.08	.13
Stroud	12	4.45	5.32	.87	1.67
Yale	10	3.37	3.68	.31	.84
			VISUAL MEMORY		
Cushing High School	2	3.00	3.75	.75	2.93
Cushing Middle School	14	3.14	4.09	.95	2.73
Drumright	2	3.63	4.26	.63	1.62
Perkins	6	3.83	4.56	.73	2.09
Ripley	3	3.50	3.92	.42	1.08
Stroud	7	3.96	4.39	.43	.93
Yale	4	2.81	3.20	.39	1.26
			PHONETIC SPELLING		
Cushing High School	2	3.75	4.25	.50	1.51
Cushing Middle School	13	3.50	3.65	.15	.38
Drumright	2	4.5	6.00	1.5	3.13
Perkins	6	3.96	3.62	-.34	-.95
Ripley	3	4.67	5.00	.33	.63
Stroud	6	2.42	3.71	1.29	4.56
Yale	4	3.24	3.38	.14	.39
			TOTAL		
Cushing High School		3.18	3.77	.59	2.48
Cushing Middle School		3.84	4.39	.55	1.31
Drumright		4.56	5.60	1.04	2.19
Perkins		4.19	4.71	.52	1.33
Ripley		4.60	4.99	.39	.78
Stroud		3.99	4.68	.69	1.70
Yale		3.22	3.68	.46	1.31

TABLE 3

DURRELL ANALYSIS OF READING DIFFICULTY TEST
GRADE LEVEL CHANGE SCORES, t RATIOS
AND ASSOCIATED PROBABILITIES

AREA	MEAN GRADE LEVEL CHANGE	df	t	p	ACTUAL GAIN EXPECTED GAIN
Oral Reading	.59 years	76	7.93	.001	1.53
Silent Reading	.54 years	76	6.58	.001	1.46
Silent Comprehension	.60 years	76	5.51	.001	1.32
Word Recognition	.56 years	62	5.53	.001	1.15
Word Analysis	.46 years	61	5.53	.001	.95
Visual Memory	.66 years	38	5.34	.001	1.97
Phonetic Spelling	.42 years	36	2.75	.01	1.09
TOTAL	.55 years				1.35

KeyMath Diagnostic Test

The KeyMath Diagnostic Test was given in a pre-post fashion to a random sample of 40 students who had been placed in the resource room for a math disability. Table 4 shows the composite gains across all of the fifteen measures on that test for the representatives from the seven schools. The 157% of actual gain over expected gain shows that the resource room has been effective in aiding students with math disabilities enhance their math skills. This 157% figure is very close to the 148% figure found on the WRAT Arithmetic Change scores.

Ripley shows the least improvement; Cushing Middle School and Stroud showed the next best gain. Then the schools of Drumright, Yale and Perkins show equivalent gain ratio. Cushing High School showed the highest actual/expected gain ratio.

Affective Domain

To gauge changes in the students' experience of themselves and their emotions, each student was administered the Piers-Harris Self Concept Scale, the Fundamental Interpersonal Relations Orientation - Behavior and Feelings (FIRO-B and FIRO-F), and the Survey of Study Habits and Attitudes in a pre-post fashion.

In the areas of self-concept, Table 5 shows the change scores in percentiles, the t ratios for dependent samples and associated probabilities for the seven schools.

Three of the seven schools showed reliable changes in self-concept. Ripley and Yale showed significant enhancement of self-concept, while Cushing High School showed a significant drop in self-concept. The other four schools all showed mean improvements in self-concept but were

TABLE 4

KEYMATH DIAGNOSTIC TEST TOTAL CHANGE SCORES,
t RATIOS, ASSOCIATED PROBABILITIES, AND
ACTUAL GAIN/EXPECTED GAIN RATIOS FOR THE SEVEN SCHOOLS

SCHOOL	N	KEYMATH CHANGE SCORE	t	p	ACTUAL GAIN EXPECTED GAIN
Cushing High School	2	.85	17.0	.05	2.57
Cushing Middle School	18	.66	5.30	.001	1.27
Drumright	2	1.50	6.00	NS	2.23
Perkins	4	.95	2.44	.10	2.29
Ripley	6	.52	2.96	.05	.71
Stroud	1	.6	-	-	1.39
Yale	7	1.07	4.96	.01	2.24
TOTAL	40	.79			1.57

TABLE 5

PIERS HARRIS SELF-CONCEPT CHANGE SCORES IN PERCENTILES, t RATIOS AND ASSOCIATED PROBABILITIES FOR THE SEVEN SCHOOLS

SCHOOL	N	SELF-CONCEPT CHANGE IN PERCENTILES	t	p
Cushing High School	11	-13.72	-2.85	.02
Cushing Middle School	25	+ 7.44	+1.53	NS
Drumright	16	+ 6.81	+1.13	NS
Perkins	9	+13.78	+1.58	NS
Ripley	15	+12.18	+2.71	.05
Stroud	16	+ 5.5	+1.36	NS
Yale	20	+ 7.7	+2.04	.06
TOTAL	112	+ 6.19	+2.05	.05

not significant. Overall the program produced a reliable enhancement of self-concept of 6.19 percentile points.

The other three affective tests - Survey of Study Habits and Attitudes, the FIRO-B and FIRO-F - showed no significant changes for the total group of program participants. Therefore the program did not impact in the student's interpersonal style at the behavioral or feeling level, and neither gains nor losses were showed in study habits or attitudes.

Linear Regression Analysis of Affective Predictors to Achievement Gains

One innovative feature of this year's evaluation was the use of linear regression analysis to understand the relationship between affective pre test measures on achievement gain scores. How does a student's self-concept and study orientation contribute differentially to Reading, Spelling and Arithmetic gains?

The following formulae describe the relationship among the independent (affective) measures, x, and the dependent (achievement gains) measures, y.

$$y = m x + b$$

Where y is the achievement gain scores, m is the slope of the linear regression line and b is the y intercept, i.e. t value of x at y equal to zero.

For WRAT Reading gain scores:

WRAT Reading Change (y) = .01 Piers Harris Self Concept Raw Score (x) +.28

$r^2 = .047$ $r = +.22$, $p < .05$, 106 df.

WRAT Reading Change (y) = .002 Study Habits Percentile (x) +.72

$r^2 = .0021$ $R = .05$, non-significant

WRAT Reading Change (y) = .005 Study Attitudes Percentile (x) +.67

$r^2 = .035$ $r = .19$, $p < .05$, 106 df.

For the WRAT Spelling gain scores:

WRAT Spelling Change (y) = .009 Piers Harris Self Concept Raw Score (x) -.08

$r^2 = .062$; $r = .25$, $p < .02$, 106 df.

WRAT Spelling Change (y) = .007 Study Habits Percentile (x) +.20

$r^2 = .055$; $r = .24$, $p < .02$, 106 df.

WRAT Spelling Change (y) = .004 Study Attitudes Percentile (x) +.28

$r^2 = .031$; $r = .18$, non-significant.

For the WRAT Arithmetic gain scores:

WRAT Arithmetic Change (y) = .005 Piers Harris Self Concept Raw Score (x) +.80

$r^2 = .011$; $r = .10$, non-significant.

WRAT Arithmetic Change (y) = .016 Study Habits Percentile (x) +.54

$r^2 = .158$; $r = .40$, $p < .001$, 106 df.

WRAT Arithmetic Change (y) = .003 Study Attitudes Percentile (x) +.85

$r^2 = .007$; $r = .09$, non-significant.

Table 6 displays the correlation coefficients among these measures in a matrix. Underlined values are significant for at least the .05 level. Figure 1 depicts a path analysis of these interrelationships.

The Piers-Harris Self-Concept Pre-Test raw score and the Study Habits Pre-Test percentile score are the two measures with the greatest number of significant relationship to other variables in the matrix. The Self Concept shows significant correlations with all but WRAT Arithmetic Change Scores. The Study Habits shows significant correlations to all but the WRAT Reading Change Scores. The Study Attitudes Pre-Test percentile score is the measure with the next highest number of significant

TABLE 6

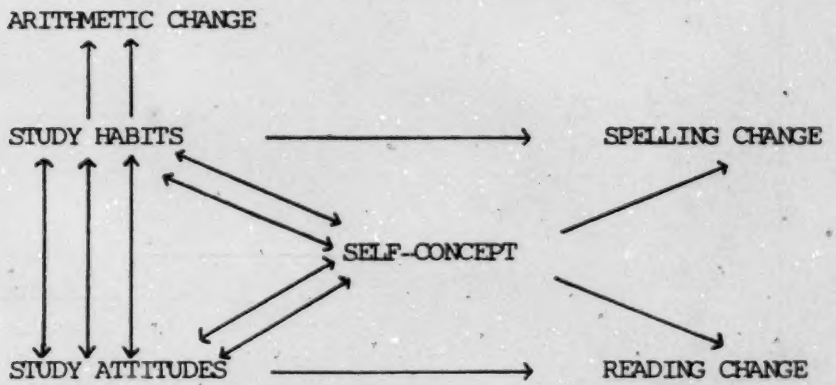
CORRELATION COEFFICIENT MATRIX AMONG AFFECTIVE PRE-TEST MEASURES AND ACHIEVEMENT GAIN SCORES

	STUDY HABITS	STUDY ATTITUDES	READING GAIN	SPELLING GAIN	ARITHMETIC GAIN
Self-Concept	.36#	.47#	.22#	.25#	.10
Study Habits	X	.78#	.04	.23#	.40#
Study Attitudes		X	.19#	.18	.09
Reading Gain			X	.09	.06
Spelling Gain				X	.15

= $p < .05$

FIGURE 1

PATH ANALYSIS OF THE INTERRELATIONSHIPS AMONG THE AFFECTIVE PRE-TEST MEASURES AND THE ACHIEVEMENT GAIN SCORES



LEGEND:

Independent Variable ——→ Dependent Variable

Independent Variable ←——→ Independent Variable

One line indicates significant but mild degree of relationship (3.6% - 10% variance)

Two lines indicate significant and moderate degree of relationship (10% - 50% variance)

Three lines indicate significant and strong degree of relationship (greater than 50%)

No line indicates no significant relationshop.

correlations, three - to Study Attitudes, Self Concept and WRAT Reading Change. Both Reading Change and Spelling Change show two significant correlates out of the possible five. Reading Change correlates with Self-Concept and Study Attitudes. Spelling Change correlates with Self-Concept and Study Habits. WRAT Arithmetic Change is the variable with the least number of significant correlations, only one - to Study Habits.

Since it is appropriate based on logic and temporal sequencing to consider the Affective pre-test measures as partially causal to the Achievement Change Scores, the linear regression analysis with the latter measures as dependent measures and the former measures as independent measures describes a predictive relationship of the affective domain to achievement gains in the cognitive domain.

The Path Analysis depicted in Figure 1 might best summarize these relationships. A significant correlation coefficient is .19 at 106 degrees of freedom. This value squared represents 3.2% of variance accounted for in one variable by another. This lower limit of reliability at the .05 level is the minimum relationship accepted to represent a linkage between two variables. An arbitrary cutoff of 10% of variance accounted for (r=.316) was selected as the upper limit for the descriptor of a significant but mild degree of relationship between two variables. The descriptor of moderate degree of relationship was set at 10% (r=.316) at the lower limit and 50% (r=.707) of accounted for variance at the upper limit. Any relationship between two variables greater than 50% of accounted for variance was given the descriptor of strong degree of relationship.

These different degrees of relationship are graphically displayed in the Path Analysis by the number of lines drawn between two variables.

No line indicates a less than significant relationship. One line indicates a significant and mild degree of relationship (up to 10% common variance). Two lines indicate a significant and moderage degree of relationship (up to 50% common variance). Three lines indicates a significant and great degree of relationship (greater than 50% common variance).

In addition, since the analysis assumes independent (affective) and dependent (achievement gain) variables, a unidirectional arrow describes the effect of the independent variable upon the dependent variable. A bidirectional arrow describes simply the relationship between two equivalent variables.

Turning to Figure 1 itself, it is seen that there are no significant correlations among the three achievement gain areas. For example, the amount of change in Reading says nothing about that student's change in either Spelling or Arithmetic. This set of findings matches the expectation that students are being involved in specific diagnostic-prescriptive plans in the resource room.

The three affective pre-test measures cluster together. While the two study orientation measures show a greater relationship to each other than to self-concept, this may be due to the similarity in method of these measures to each other rather than some strong construct difference between study orientation and self-concept.

The difference among the three affective measures are most clearly revealed by their predictive relationship to the three achievement gain areas. Reading Change is predicted by Self-Concept and Study Attitudes. The greater the student's self-concept and the more value he places on teachers and education in general, the greater that student will improve

in his Reading achievement. However it is important to note that, even assuming independent contributions from self-concept and study attitudes, only 9% of the true variance is accounted for in the student's degree of reading improvement by the combination of these two affective contributions.

Spelling Change is predicted by Self-Concept and Study Habits. The greater the student's self-concept and the more orderly his study habits and the less he procrastinates, the greater that student will improve in his Spelling achievement. Given the assumption of independent contributions, 11% of the true variance is accounted for in the student's degree of Spelling gains by the combination of self-concept and study habits.

Arithmetic Change is predicted by only Study Habits. The more orderly his study habits and the less he procrastinates, the greater that student will improve in his Arithmetic achievement. Sixteen percent (16%) of the true variance is accounted for in the student's degree of Arithmetic gains by his study habits.

Self-concept contributes to both Reading and Spelling gains, but not to Arithmetic gains. Study Attitudes contributes only to Reading gains. Study Habits contributes to both Spelling and Arithmetic gains and is the sole significant predictor of arithmetic improvement.

Both Reading and Spelling gains are dually predicted. Self-concept is important to both. However for Reading Change the student's attitude towards his teachers and educators compose the second contribution, while for Spelling Change it is the student's study habits that provides the second contribution.

Arithmetic gain is surprisingly unresponsive to differences in self-concept or study attitudes and is solely based upon Study Habits within this choice of affective measures. Also linear regression analyses were computed for the three achievement gain areas, using the various FIRO-B and FIRO-F measures as predictors. No reliable relationships were found with the interpersonal style measures.

Typical cautions should be understood about the potential overinterpretation of these findings. While the partially caused relationships between affective measures and achievement gains is possible, these relationships could describe a concordance in these measures that is mediated by a antecedent condition common to both measures. While IQ was not partialled out of these regression analyses, it is improbable that IQ would be a strong candidate for a common antecedent condition because the Survey of Study Habits and Attitudes and Self-Concept measures are viewed as relatively independent from intelligence measures, especially given the somewhat restricted range of IQs imposed by the definition of learning disabilities.

One might more reasonably argue that differing cognitive styles could produce differences in pre-test affective measures and also achievement change scores. A student with an analytic cognitive approach might attend to details in a manner that would provide better study habits and produce greater arithmetic and also spelling gains over an academic course. A student with a positive outlook on the world might value education and teachers to a greater degree and also be more open to the contextual cues that permit for greater incidental learning in reading.

Arithmetic may involve such a degree of concentration within oneself that it permits not only students who have a good and integrated

view of themselves to do well in math, but also students who avoid the reminders in the external word of their poor self concept to excell in this potentially defensive cognitive process of shutting out the emotional world of words.

A final explanation of these findings is that these affective pre-test measures are partially causal or contributory to the changes in achievement.

If the latter case were true, greater emphasis could be placed on specific programs to improve one's study habits, attitudes and self-concept with the reasonable expectations that these changes would contribute positively to achievement gains for LD students. This is not an especially novel idea. Good programs for LD students should be attentive to their self concept and study orientation. The information gained through the present analyses is the differential strategy to use with what remediation area. Given a finite degree of effort in any educational program, choices need to be made as to the emphasis that needs to be given to the type of affective education.

If a student had only a deficit in math but showed no disability in verbal skills, then attacking the student's study habits for several periods a week may be a more efficient use of time than to involve him in self-concept building activities or attitude change programs about school. If the student had a deficit in reading alone, then the plan would be exactly opposite. More research needs to be performed on first, the replicability of the path analysis and second, the determination that environmentally produced changes on the affective domain are causally linked to the achievement gains.

VALIDATION OF A MNEMONIC TECHNIQUE TO INCREASE VOCABULARY

In order to test the applicability of a previously found successful memory enhancement technique to a learning disabled population, the Keyword Mnemonic Method was used in an experimental study. Forty male students volunteered to participate. Twenty were randomly assigned to the control group and twenty to the experimental group. The task to be learned was Spanish nouns. Table 7 depicts the phases of the experiment. The dependent measure of most interest was the proportion of the list of English meanings recalled correctly by each group on the baseline phase, experimental phase and delayed recall test.

On the baseline phase, the mnemonic group recalled .152 of the list and the control group recalled .179 of the list. This was not a significant difference. In the experimental phase, the mnemonic group recalled .848 of the list; the control group recalled .164 of the list. This interaction of Group X Phase in an ANOVA was highly significant, $F(1,38) = 551.38$, $p < .0001$. Therefore the students who learned the Keyword Method recalled significantly more of the list than the control group.

On the delayed recall test, the mnenomic group recalled .850 of the list and the control group recalled .193 of the list. A t test showed this difference to be highly significant, $t(38) = 14.3588$, $p < .0001$. Therefore after five minutes of interpolated activities the differences

TABLE 7

DETAILED DIAGRAM OF THE PHASES OF THE EXPERIMENT

Baseline Phase → Teaching Period → Experimental Phase: Control or Mnemonic Procedure → Interpolated Activities: Basic Process Tasks → Delayed Recall Test

Phases	GROUP	
	CONTROL	MNEMONIC
Baseline Trials	Example "Tijeras" → "Scissors" Study: Stimuli 1 → Response 1 S 2 → R 2 S 3 → R 3 . . . . . . S 14 → R 14	Same as for Control Group
	Test: S 1 → ? S 2 → ? S 3 → ? . . . . . . S 14 → ?	
Teaching Period	One study-test trial over a list of five items was given. The items were in the same order for the study and test aspects. These are the same items that the experimental group works with in this part of the experiment.	The first two items were used as examples in the explanation of the keyword method. The subjects practiced using the keyword method in studying three more items. The subjects were then tested over the five items.

(continued)

TABLE 7 (continued)

DETAILED DIAGRAM OF THE PHASES OF THE EXPERIMENT

Phases	GROUP	
	CONTROL	MNEMONIC
Experimental Period	Example "Jabon"⟶"Soap" Stimuli 20—Response 20 S 21⟶R 21 S 22⟶R 22 Study . . . S 34⟶R 34 S 20⟶? S 21⟶? S 22⟶? Test . . . S 34⟶?	"Jabon"⟶"Bone"⟶"Soap" S 20⟶Keyword⟶R 20 S 21⟶Keyword⟶R 21 S 22⟶Keyword⟶R 22 Study . . . S 34⟶Keyword⟶R 34 S 20⟶Keyword⟶? S 21⟶Keyword⟶? S 22⟶Keyword⟶? Test . . . S 34⟶Keyword⟶?
Basic Process Tasks	The seven basic process tasks.	The seven basic process tasks.
Delayed Recall	Example "Jabon"⟶? S 20⟶? S 21⟶? S 22⟶? . . . S 34⟶?	"Jabon"⟶?⟶? S 20⟶?⟶? S 21⟶?⟶? S 22⟶?⟶? . . . S 34⟶?⟶?

between the two groups recall did not change; the mnemonic group continued to show strong superiority over control.

If the technique can improve their learning of English meanings of Spanish words from 15% of a list to 85% of a list, it is likely that it could increase to the same degree learning of English words. The Spanish vocabulary was used to insure total unfamiliarity with the stimuli.

SPECIAL ACCOMPLISHMENTS

1. The Oklahoma project for Secondary Learning Disabled students has been adopted and replicated in ten States. These States include Texas, Maine, Missouri, Minnesota, North Carolina, Washington, Connecticut, Massachusetts, New Hampshire and Kansas.
2. The Oklahoma Child Service Demonstration Center has been formally adopted in thirty school districts in the State of Oklahoma during the fiscal year of 1977-1978.
3. The Oklahoma Child Service Demonstration Center received and distributed over 5,000 project developed materials during the fiscal year of 1977-78. These products include Multi-Media Materials Catalogues, Teacher Made Materials Handbook, Diagnostic Handbook, Teacher Training Manual, I.E.P. Packet and Mainstreaming Manual.
4. The Oklahoma Child Service Demonstration Center presented formal workshops at five (5) National and International Conferences during fiscal year 1977-78.
5. The Oklahoma Child Service Demonstration Center was featured in ten major newstories, six national publications and one Chapter in a book dealing with Secondary Learning Problems.
6. The Oklahoma project successfully implemented the first Resource Room in a Vocational Technical School in the State of Oklahoma. This program currently serves as a model for the State and Region.

7. The Oklahoma Child Service Demonstration Center during the fiscal year 1977-78 presented training sessions for eight University teacher training programs.
8. Twenty-five percent of the students enrolled in the Oklahoma Child Service Demonstration Center program were successfully mainstreamed during the fiscal year 1977-78. This represents one in four students enrolled in the program successfully being mainstreamed back into the regular curriculum.
9. Staff members of the Oklahoma Child Service Demonstration Center developed products, materials and field tested instruments which are currently being implemented in classes all over the United States and in Canada and Australia during the fiscal year 1977-78.
10. The Oklahoma Child Service Demonstration Center projects received visitors from twenty different States during fiscal year 1977-1978. These educators were interested in viewing the program as well as receiving formal training from staff members.
11. A state-wide television station filmed "on the spot coverage" of the project, October, 1977.